Rogers Cantaze

GCA-TR-82-82-G

Prepared for

U.S. Environmental Protection Agency
Region V
Chicago, IL 60604

Contract No. 68-01-6421
Work Assignment No. 007

EPA Project Officer

Irvin J. Dzikowski

DETAILED PROCESS EVALUATION OF SELECTED INDUSTRIAL WASTE TOXICANT DISCHARGERS TO THE SAUGET, ILLINOIS POTW

Draft Final Report

August 1982

Prepared by

William Farino
Thomas Munno

GCA CORPORATION
GCA/TECHNOLOGY DIVISION
Bedford, Massachusetts

SECTION 4

ROGERS CARTAGE CO.

PROCESS DESCRIPTION

Rogers Cartage is a transporter of a variety of chemical products from producer to consumer in the food, petroleum, plastics and pharmaceutical industries. The Sauget terminal provides facilities for tank truck cleaning; internal and some external cleaning is performed. On a normal, 6-day per week operation, 70 to 75 trucks are cleaned.

Certain trucks are designated as "dedicated" for transporting specific products. Dedicated trucks are not cleaned at the Sauget terminal, however, when truck cleaning becomes necessary (repairs or maintenance required) dedicated trucks are sent to a truck cleaning facility in Texas. The material cleaned from the truck at the Texas facility is drummed and transported to an incinerator in Baton Rouge, LA (Rollins Environmental Services).

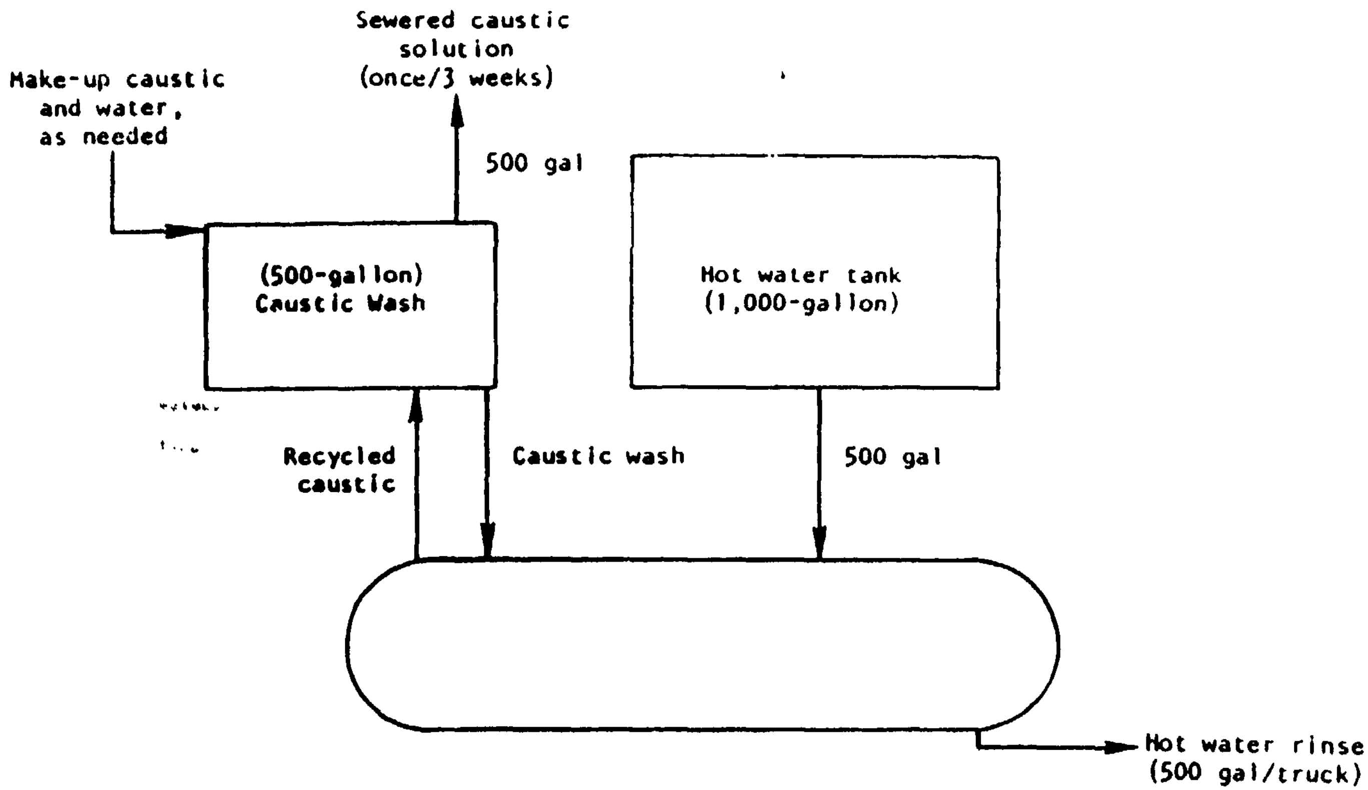
Depending on the type of material transported, two tank (internal) cleaning methods are used: (1) hot caustic wash with hot water rinse, or (2) hot water rinse. Figure 6 is a flow diagram of the cleaning process at Rogers Cartage. Table 9 lists the commodities hauled and cleaning methods used over a 1-month period. External portions of the truck are cleaned periodically (as needed basis) with a stainless steel cleaning solution.

Hot Caustic Wash

Hot caustic wash (50 percent solution NaOH) is recirculated via a 500-gallon holding tank. The solution is delivered (under pressure) into the truck via a rotating spray nozzle. The caustic holding tank is discharged to the sewer every 3 weeks. Periodically make-up water and caustic are added to the holding tank to maintain a 500-gallon level. Hot caustic wash is used when materials have a high insolubility or low affinity to hot water alone, such as petroleum products, oil-based materials and plastic resins.

Hot Water Rinse

All trucks are rinsed with approximately 500 gallons of hot water. Hot water (city water) is kept in a 1,000-gallon holding tank and maintained at approximately 190°F. Trucks are spray cleaned in a manner similar to hot caustic wash. Hot water is discharged to the sewer after each rinse.



Approximate Daily Sewer Discharge = 6000 gpd (based on 12 trucks cleaned/day)
(for truck cleaning only)

Figure 6. Flow diagram of Rogers Cartage truck cleaning process.

TABLE 9. REPRESENTATIVE CROSS-SECTION OF MATERIALS TRANSPORTED BY ROGERS CARTAGE CO. OVER A 1-MONTH PERIOD[a]

Commodity/ Trade Name	No. of trucks serviced	Type of wash: Caustic	Type of wash: Hot water	Comments	Toxicity level
Formaldehyde	[illegible]		x		LDLo = 30 mg/kg (human) TLm 96 = 100-10 ppm
Deicer	[illegible]		x	• Airline deicer fluid	
Alum	8	x	x		
Dibutyl hydrogen phosphate	1		x		LD_{50} = 3200 mg/kg (rat)
Muriatic acid	3		x	• Commercial grade of HCl	LDLo = 81 mg/kg (human)
Silicate	2		x		
Fatty acid	11		x	• (soap)	
Phosphoric acid	3		x		LD_{50} = 1530 mg/kg (rat) TLm 96 = 100-10 ppm
Zinc sulfate co[illegible]ion	2		x		TDLo = 45 mg/kg (human)
Triethylene glycol	1		x		LD_{50} = 17 g/kg (rat) TLm 96 = over 1000 ppm
Polypropylene glycol	1		x		LD_{50} = 15-9760 mg/kg (rat)[b]
Caustic	14		x		LDLo = 500 mg/kg (rabbit) TLm 96 = 100-10 ppm
Can coating	5		x	• Water soluble resin	
Polymer	3	x	x		LD_{50} = 25 g/kg (rat)[d]
Plasticiser	11	x	x		LD_{50} = 18-8720 mg/kg (rat)[b]
Resin	2	x	x		
Linseed oil	1	x	x	• Used in paint industry	
Hydraulic oil	1	x	x		
Mineral spirits	1		x		LDLo = 1470 mg/kg (human) TLm 96 = over 1000 ppm

(continued)

[illegible] Jon Barney
[illegible] August 1, 1982
[illegible] Fig. 11

DO NOT RELEASE WITHOUT FOIA DETERMINATION

29

CER 127221

S 00861

DCG 016546

TABLE 9 (continued)

Commodity/ Trade Name	No. of trucks serviced	Type of wash: Caustic	Type of wash: Hot water	Comments	Toxicity level[b]
Petroleum naphtha	1		x	• Aromatic solvent	LDLo = 2500 mg/kg (mammals)
Xylene/Benzene	1		x	• Trace quantities of benzene	Xylene - LD_{50} = 4300 mg/kg (rat) Benzene - LDLo = 130 mg/kg (human) Tlm 96 = 100-10 ppm (for both)
Phenol	3		x		LDLo = 140 mg/kg (human) Tlm 96 = 100-10 ppm
Alcohol	1		x		
Alkane	1	x	x		LD_{50} = 6856-12,780 mg/kg (mouse)[c]
Flewcon	13	x	x	• Oil drilling fluid	
Santochlor	2		x	• (dichlorobenzene) • Used in the production of moth balls	TDLo = 300 mg/kg (human)
Soap	11		x		
Bonderite	1		x	• Metal cleaner	
Process oil	1	x	x		
Motor oil	2	x	x		
Crude treating compound	21	x	x	• Descaler (combustible)	
Black oil	1	x	x	• Road oil (heavy oil)	
Skim oil	1	x	x	• API separator	
Soybean oil	11		x		
Lard	1		x		
Fatty alcohols	1		x		
Food grade oil	1		x		

(continued)

TABLE 9 (continued)

Commodity/ Trade Name	No. of trucks serviced	Type of wash: Caustic	Type of wash: Hot water	Comments	Toxicity level[b]
Paint increasing compound	[illegible]	x	x	• Contains some toluene	
Paint (enamel)	1	x	x		LD50 > 200 mg/kg (rat)[g]

[a]Does not include material carried in "dedicated" trucks.

[b]Source: Reference 4.

[c]Toxicity range reported for various mixtures of polypropylene glycol designated by the following numbers: 150, 400, 425, 750, 1025, 1200, 2025, 3025, and 4025.

[d]Toxicity reported for Polymer X-150.

[e]Toxicity range reported for various plasticizers designated as: G-316, 400, GPE, and 788.

[f]Toxicity range reported for Alkanes 56, 60, and 5.

[g]Toxicity reported for enamel white (barium sulfate).

WASTE STREAM ANALYSIS

The data in Table 9 indicate the variety of compounds and the types of cleaning performed at Rogers Cartage. GCA estimates that approximately 600 galons of wastewater from tank truck washing is generated daily based on cleaning an average of 12 trucks per day. A recent study[11] of tank truck wash operations showed highly variable pollutant characteristics given in Table 10.

The variability ratio in Table 10 represents the probably ratio of expected high to expected low values. The variability of volume and characteristics of wastewater from tank truck cleaning can be attributed to:

- Type and amount of material remaining in the truck after delivery (referred to as the heel).
- Type of wash performed.
- Number of trucks serviced.

The amount of material in the truck prior to cleaning, designated as the "heel", is a function of the following chemical-physical characteristics of the material:

- viscosity
- volatility (vapor pressure)
- density

Occasionally, products delivered by Rogers Cartage may not be entirely accepted by the consignee, simply due to the lack of storage facilities. In this case, the Rogers employee is required to inform the Sauget terminal to report the amount of "heel" undeliverable and arrangements are made with the shipper (product origin) to return the undelivered portion. Under no conditions are heels of substantial quantity returned to or serviced by Rogers Cartage.

It is conceivable that some quantity of heel (1 to 5 gallons) may be present in a truck due to the physical-chemical properties mentioned above. Highly viscous materials, such as petroleum-related products and oil-based fluids, will not drain as easily as low viscosity materials. High vapor pressure (low boiling point) materials will contribute little or no residual in the tank and will volatize more readily during hot wash cleanings.

WASTE STREAM TOXICITY EVALUATION

A review of compounds presented in Table 9 indicate the presence of some priority pollutants; i.e., zinc (from zinc sulfate solution), phenol, xylene/benzene. Formaldehyde is also regarded as an atmospheric toxicant. The quantity of these compounds remaining as residual is probably very small

(1 gallon or less). Xylene by itself is not considered a priority pollutant, however, in the production of xylene trace quantities of benzene are normally present.

TABLE 10. RAW WASTEWATER FROM TANK TRUCK WASH OPERATIONS[a]

	Mean	Variability ratio[b]
Flow, gal/tanker washed	1,390	6
BOD_5, mg/L	2,800	3
COD, mg/L	12,000	3
SS, mg/L	4,035	19
Phenols, mg/L	29	12

[a]Source: Reference 11.

[b]Ratio is generated using monthly average values at 5 terminals. Each value is an average of 3 to 6 daily composite values taken that month. Values at 90 percent level of occurrence are divided by those at 10 percent level of occurrence to produce the variability ratio.

Residual quantity is the major factor in determining waste stream toxicity. Small quantities of light hydrocarbons (formaldehyde, benzene, etc.) may not pose a significant threat to wastewater quality. Hot water cleaning (at 190°F) may cause substantial evaporation of low boiling point compounds.

Virtually all water pollutants are removed from the truck's tank during the caustic wash cycle. Subsequent rinsing with hot water may add trace quantities of caustic washing solution to the waste stream.

MONITORING PLAN

At present, Rogers Cartage is not monitored by the Sauget POTW for flow or composite sampling due to Rogers Cartage low discharge rate (approximately 6000 gpd, based on 12 truck cleanings per day). High pH excursions during discharge of caustic solution are not a main concern of the treatment facility, according to the chief operator, because the Sauget POTW generally handles wastes which are acidic in nature. Currently, Rogers Cartage informs the Sauget POTW prior to a caustic discharge.

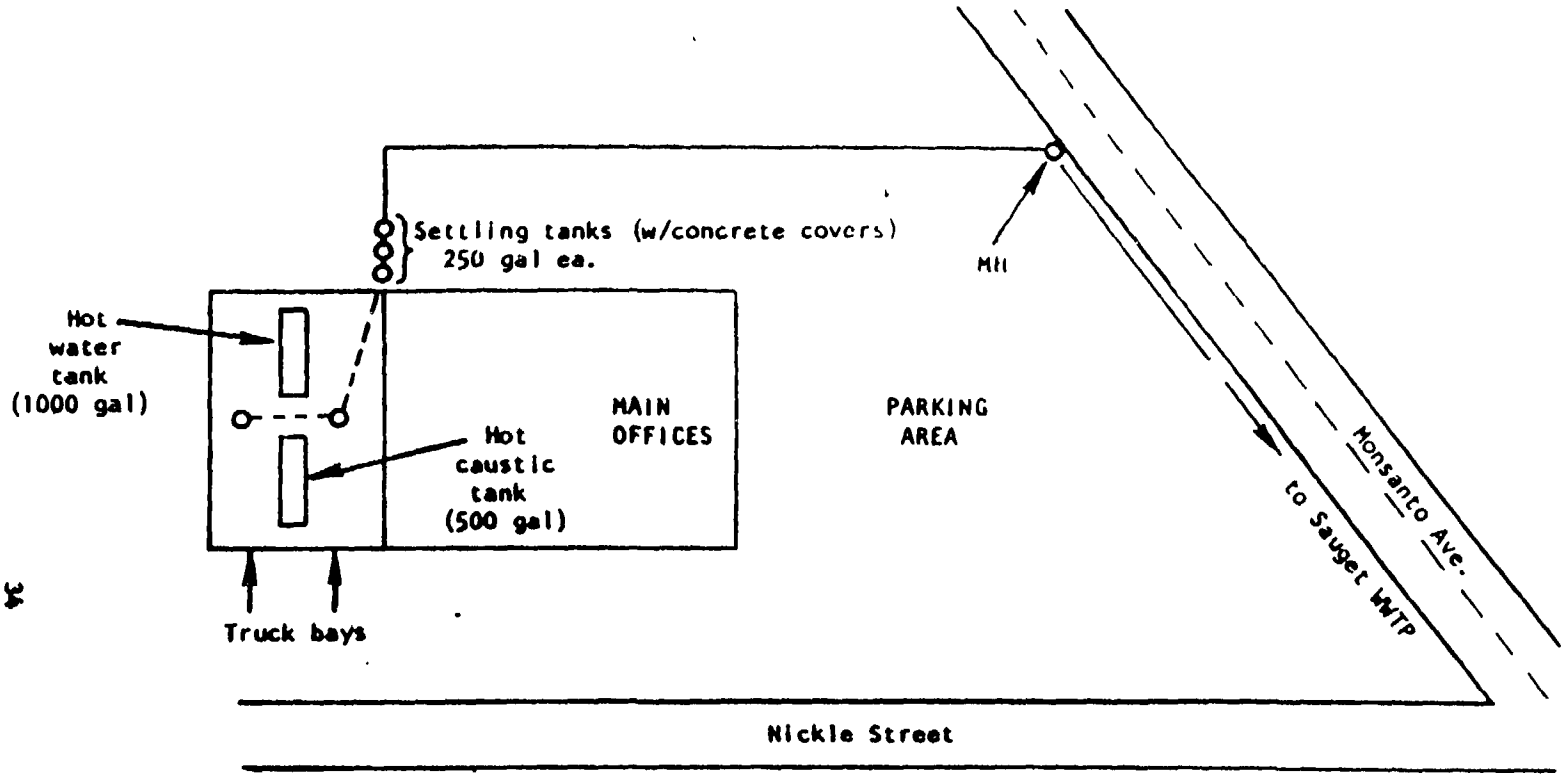


Figure 7. Plant layout for Rogers Cartage Co. (Sketch not to scale).

The nature of tank truck wastewater generated by Rogers Cartage may be potentially toxic and could be characterized by an extensive monitoring program. Grab samples of Rogers Cartage effluent could be obtained from the setting tanks shown in Figure 7. However, results from grab sampling would tend to be specific to the type of truck most recently washed. Accurate characterization of Rogers Cartage wastewater would require the use of a flow actuated automatic sampler located in the manhole on Monsanto Ave., just outside the plant.

GCA's assessment of sampling point locations necessary for process segregation are summarized in Table 11. For process segregation, it will be necessary to sample at the outlet port from the truck being washed. This will enable separate results for hot caustic and hot water washes. Note that hot caustic solution (recycled) samples may only be representative of a specific time, dependent on the number and types of trucks cleaned and the age of the solution.

TABLE 11. SAMPLING POINT LOCATIONS--ROGER'S CARTAGE

Sample point	Process	Comments
Truck drain	Hot caustic solution	Recirculated solution is discharged to sewer every 3 weeks.
Truck drain	Hot water rinse	Hot water rinse is used exclusively or after hot caustic wash depending on truck contents.
Steet man hole	Total plant effluent	Includes sanitary.

Similarly, hot water rinse (not recycled) samples will be representative of one specific truck, thus more than one truck, should be sampled. Settling tank sludge samples may help characterize types of waste handled over a period of time. However, settling tank covers must be removed with a backhoe.

WASTE STREAM TREATABILITY

Pretreatment currently employed at Rogers Cartage consists of three underground 250-gallon settling tanks in series. The tanks are provided to allow settling of solids from the tanks for flow equalization. Sludge collected in the tanks is seldom removed. Operational practices at the facility require that caustic wastes are slowly bled to the treatment plant as opposed to batch discharge.

A hybrid wastewater treatment system for truck cleaning wastes investigated by Obrieneted involved the following unit operations:

1. Oil separation--to remove oil/grease

2. Air flotation--to break emulsion and remove oil/grease/suspended solids

3. Chemical coagulation and pH adjustment--to aid in removal of suspended solids

4. Equilibration/sedimentation--allows separation of solids and prepares waste for further treatment

5. Mixed media filtration--to further remove solids/color

6. Carbon adsorption--to remove organics which may be toxic to biological systems

7. Rotating filter-biofiltration system--to remove degradable organics

This system was designed, however, for direct discharge to a receiving stream. For Rogers Cartage parameters of concern would be pH, floating oil/grease and toxic organic compounds. The existing physical/chemical treatment facility at Sauget should effectively adjust pH and reduce floating oils. The small quantity of toxic organic compounds discharged by Rogers Cartage will not pose a threat to the operation of the new regional biological treatment facility due to dilution. However, complex organic compounds may not be substantially removed by the new facility.

Although only activated carbon adsorption would be necessary to remove complex toxic organic compounds, a pretreatment scheme involving steps 1 through 6 described above would be required. Steps 1 through 5 would be necessary preliminary steps to prevent fouling of the carbon and increase bed life. The results of sampling studies conducted in February 1982 should be careful in making a final decision on whether pretreatment of Rogers Cartage wastewater will be necessary.